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Section 2.0 – LKA 113 Class: Vessels Removed from Active Duty and Non-operational Vessels

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SECTION 2.0 – LKA 113 CLASS

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2.0 LKA 113 CLASS

The Navy's CHARLESTON Class (LKA 113) was selected to represent the group of non-operational vessels. Non-operational vessels are those ships and service craft that have been removed from active service or commission. As a result of the inactivation process, all of the systems on-board non-operational vessels are shut down and secured. These vessels are sealed and equipped with multiple dehumidifiers to keep the vessel's interior dry. As a result, non-operational vessels generate or accumulate essentially no bilgewater. Also, due to their inactive status, vessels within this group spend 365 days annually in port, typically at a Naval Inactive Ship Maintenance Facility (NISMF) or Maritime Administration (MARAD) site, until their final disposition is determined. While LKA 113 Class vessels are equipped with a gravity coalescence type oil water separator (OWS), this equipment is not operated on vessels in non-operational status. Although LKA 113 Class vessels produce essentially no bilgewater, any potential bilgewater accumulation would be transferred to shore by maintenance personnel. The following marine pollution control devices (MPCDs) are evaluated in this feasibility analysis for LKA 113 Class vessels: gravity coalescence, centrifuge, collection, holding, and transfer (CHT), evaporation, hydrocyclone, *in situ* biological treatment, oil absorbing socks, filter media, and membrane filtration.

2.1 CENTRIFUGE

Centrifuges require several support services, including electrical power, compressed air, potable water, and possibly steam. Because all shipboard systems are shut down and secured when vessels are placed in non-operational status, these support services are not available on LKA 113 Class vessels. Additionally, centrifuges require periodic maintenance and operational oversight by ship's crew. However, vessels placed in non-operational status have little to no crew assigned to them and have limited funds available for maintenance activities. Most vessels placed in non-operational status are located at one of four NISMFs, where services such as dehumidification and, if required, bilge pumping are provided. Due to the lack of utilities and crew, installation and operation of centrifuges on LKA 113 Class vessels, or any non-operational vessel, are not feasible.

2.2 COLLECTION, HOLDING, AND TRANSFER (CHT)

The following sections discuss the feasibility and cost impacts of practicing CHT on-board LKA 113 Class vessels.

2.2.1 Practicability and Operational Impact Analysis

This section analyzes specific feasibility criteria relative to the physical characteristics and operational requirements of CHT.

2.2.1.1 Space and Weight

All shipboard systems are shut down and secured on inactive vessels. These vessels are sealed and provided with multiple dehumidification systems that remove essentially all moisture from inside the ship. In the unlikely event that bilgewater does accumulate, the NISMFs are equipped

to pump any collected bilgewater to shore. Therefore, practicing CHT on inactive vessels does not result in any space and weight impacts.

2.2.1.2 Personnel/Equipment Safety

All equipment is shut down and secured and no personnel are assigned to non-operational vessels. Therefore, there are no personnel or equipment safety concerns associated with this MPCD.

2.2.1.3 Mission Capabilities

Not applicable for non-operational vessels.

2.2.1.4 Personnel Impact

Because a crew is not assigned to inactive vessels, there are no personnel impacts associated with practicing CHT on LKA 113 Class vessels.

2.2.1.5 Consumables, Repair Parts, and Tools

There are no requirements for consumables, repair parts, or tools associated with CHT.

2.2.1.6 Interface Requirements

Using shore-based services, NISMFs are equipped to pump any accumulated bilgewater to shore. Practicing CHT on inactive vessels does not require any interface requirements.

2.2.1.7 Control System Requirements

There are no automated control system requirements associated with CHT.

2.2.1.8 Other/Unique Characteristics

No other/unique characteristics have been identified with respect to this MPCD option.

2.2.2 Cost Analysis

As discussed in Section 2.0, LKA 113 Class vessels produce essentially no bilgewater. As such, the cost associated with practicing CHT on-board LKA 113 vessels is expected to be insignificant. Therefore, a cost analysis is not necessary.

2.3 EVAPORATION

Evaporation units require proper ventilation and support services (e.g., electrical power). Because LKA 113 Class vessels are in non-operational status, their ventilation ducts are sealed to prevent moisture from entering the vessel. In addition, because all shipboard systems are shut down and secured, support services are not available on LKA 113 Class vessels. Additionally, evaporation units require periodic maintenance and operational oversight by the ship's crew. However, vessels placed in non-operational status have little to no crew assigned to them and

have limited funds available for maintenance activities. Most vessels placed in non-operational status are located at one of four NISMFs, where services such as dehumidification and, if required, bilge pumping are provided. Due to the lack of utilities and crew, installation and operation of evaporation units on LKA 113 Class vessels, or any non-operational vessel, are not feasible.

2.4 GRAVITY COALESCENCE

Gravity coalescence type OWS units are installed on LKA 113 Class vessels. However, these units are not operated on inactive LKA 113 Class vessels. Because all shipboard systems are shut down and secured when vessels are placed in non-operational status, necessary support services, such as electrical power, potable water, and seawater, are not available. Additionally, gravity coalescence units require periodic maintenance and operational oversight by the ship's crew. However, vessels placed in non-operational status have little to no crew assigned to them and have limited funds available for maintenance activities. Most vessels placed in non-operational status are located at one of four NISMFs, where services such as dehumidification and, if required, bilge pumping are provided. Therefore, operation of gravity coalescers on LKA 113 Class vessels, or any non-operational vessel, is not feasible.

2.5 HYDROCYCLONES

Hydrocyclones require several support services, including electrical power and compressed air. Because all shipboard systems are shut down and secured when vessels are placed in non-operational status, these support services are not available on LKA 113 Class vessels. Additionally, hydrocyclones require periodic maintenance and operational oversight by ship's crew. However, vessels placed in non-operational status have little to no crew assigned to them and have limited funds available for maintenance activities. Most vessels placed in non-operational status are located at one of four NISMFs, where services such as dehumidification and, if required, bilge pumping are provided. Due to the lack of utilities and crew, installation and operation of hydrocyclones on LKA 113 Class vessels, or any non-operational vessel, are not feasible.

2.6 *IN SITU* BIOLOGICAL TREATMENT

In Situ biological treatment of bilgewater is the addition of microbes to a vessel's bilge spaces to digest the oil content of the bilgewater. For *in situ* biological treatment to be effective, the microbes must be left in the bilge for a sufficient period of time to digest the bilgewater's oil content. According to the vendor, the most effective use of *in situ* biological treatment for the wastewater that accumulates in the bilge is to leave the *in situ* material in the bilge spaces on the vessel for a 30-day period to establish a population of microbes (Opsanick, 2000). *In situ* material could be left in the bilge spaces to reduce the oil content of any bilgewater generation that might occur. However, LKA 113 Class vessels practice CHT without significant cost or operational impacts. *In situ* biological treatment was assumed not to provide any significant benefit because their treatment process is only expected to affect organic constituents, which are expected to be present at minimal concentrations for this vessel class. Additionally, the treated bilgewater would ultimately be transferred to a treatment facility. Therefore, no further analysis will be performed for the *in situ* biological treatment MPCD option.

2.7 OIL ABSORBING SOCKS

Oil absorbing socks (OASs) are designed to absorb oil found floating on the surface of a body of water (Sorbent Products Inc., 2000). In this application, OASs would be placed inside the bilge areas of a LKA 113 Class vessel to continuously absorb the waste oil from the bilgewater. When the OASs become fully saturated, they are manually removed and replaced with new OASs. OASs could be left in the bilge spaces to absorb the oil content of any bilgewater generation that might occur. However, LKA 113 Class vessels practice CHT without significant costs or operational impacts. OAS use was assumed not to provide any significant benefit because the treatment process is only expected to affect organic constituents, which are expected to be present at minimal concentrations for this vessel class. Additionally, the treated bilgewater would ultimately be transferred to a treatment facility. Therefore, no further analysis will be performed for the OAS MPCD option.

2.8 FILTER MEDIA

Filter media units do not require any support services. However, this is a secondary treatment option that requires pretreatment through a primary OWS. In addition, filter media requires a pump from a primary OWS to push the wastestream through the unit. All current primary OWS options require at least one of several support services, including electrical power, compressed air, potable water, and possibly steam. Because all shipboard systems are shut down and secured when vessels are placed in non-operational status, these support services are not available on LKA 113 Class vessels. Additionally, filter media units require periodic maintenance and operational oversight by the ship's crew. However, vessels placed in non-operational status have little to no crew assigned to them and have limited funds available for maintenance activities. Most vessels placed in non-operational status are located at one of four NISMFs, where services such as dehumidification and, if required, bilge pumping are provided. Due to the lack of operational primary OWSs, utilities, and crew, installation and operation of filter media units on LKA 113 Class vessels, or any non-operational vessel, are not feasible.

2.9 MEMBRANE FILTRATION

Membrane filtration systems, a secondary treatment option, require pretreatment through a primary OWS. Both membranes and OWS units require several support services, including electrical power, compressed air, and potable water. Because all shipboard systems are shut down and secured when vessels are placed in non-operational status, these support services are not available on LKA 113 Class vessels. Additionally, membranes require periodic maintenance and operational oversight by the ship's crew. However, vessels placed in non-operational status have little to no crew assigned to them and have limited funds available for maintenance activities. Most vessels placed in non-operational status are located at one of four NISMFs, where services such as dehumidification and, if required, bilge pumping are provided. Due to the lack of utilities and crew, installation of a membrane filtration system on LKA 113 Class vessels, or any non-operational vessel, is not feasible.